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AUTHOR Rotzien, Andrea; And Others
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ABSTRACT

Loving is a fundamental aspect of being human. Freud himself argued that the inability to love leads to illness, and some empirical research appears to support his view. Yet knowledge of the nature of love remains primitive, because until recently it was not considered scientifically respectable to investigate love phenomena. This study used confirmatory factor analytic methods to test the fit of various models to data provided by 499 college students who completed the 1990 version of the Hendrick and Hendrick Love Attitudes Scale. The results suggest that counselors and researchers should not treat the love styles delineated by Lee (eros, ludus, storge, mania, pragma, and agape) as discrete or uncorrelated entities. The results suggest that some variations in Lee's model may result in improved fit to data from various subjects. (NB)

A confirmatory factor analysis of the Hendrick-Hendrick Love Attitudes Scale: Implications for counseling

Andrea Rotzien Tammi Vacha-Haase Kavita Murthy

Donna Davenport Bruce Thompson

Texas A&M University 77843-4225

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ABSTRACT

Loving is a fundamental aspect of being human. Freud himself argued that the inability to love leads to illness, and some empirical research appears to support his view. Yet our knowledge of the nature of love remains primitive, because until recently it was not considered scientifically respectable to investigate love phenomena. The present study used confirmatory factor analytic methods to test the fit of various models to data provided by 499 subjects on the 1990 version of the Hendrick and Hendrick Love Attitudes Scale. The results suggest that counselors and researchers should not treat the love styles delineated by Lee as discrete or uncorrelated entities. The results are also suggestive that some variations in Lee's model may result in improved fit to data from various subjects.

Love is among the most fundamental aspects of the experience of being human. Freud (1924) himself argued that, "A strong ego is protection against disease, but in the last resort we must begin to love .n order that we may not fall ill, and we must fall ill if, in consequence of frustration, we cannot love" (p. 42). Similarly, Sternberg and Grajek (1984) noted that

> Love can be among the most intense of human emotions, and is certainly one of the most sought after. People have been known to lie, cheat, steal, and even kill in its name, yet no one knows quite what it is. (p. 320)

And the nature of love remains of interest to persons other than academics and therapists, if the popular press is any indication (cf. "Finding Out", 1992; Gray, 1993).

Unfortunately, previous empirical research provides limited understanding of love phenomena, because historically researchers have "believed that love is too mysterious and too intangible for scientific study" (Wrightsman & Deaux, 1981, p. 170). Initial investigations of love phenomena conducted during the 1940s were "followed by nearly a 20-year period in which there is almost no published evidence of efforts to investigate love phenomena using inventories or paper-and-pencil testing" (Elkins & Smith, 1979, p. 10). Love was not mentioned in the 23 volumes of the Annual Review of Psychology that Curtin (1973) surveyed.

However, as C. Hendrick and S. Hendrick (1986, p. 392) noted, "During the past decade, love has become respectable as an area for

study by psychologists." Work by Rubin (1984) and by Tennov (1979) illustrates efforts to develop science in this area of inquiry. Two distinct traditions have emerged in contemporary research regarding love phenomena, as summarized by Thompson and Borrello (1992a).

Of these two traditions, the series of studies of interest in the present inquiry involves the *deductively*-grounded work (Borrello & Thompson, 1990a, 1990b; C. Hendrick & S. Hendrick, 1986, 1989, 1990; C. Hendrick, S. Hendrick, Foote & Slapion-Foote, 1984; S. Hendrick & C. Hendrick, 1987a, 1987b; Thompson & Borrello, 1990, 1992b) that invokes Lee's (1973/1976) theoretical typology of love. These studies have employed one of the versions of the Love Attitudes Scale developed by the Hendricks.

The Hendrick-Hendrick instrument uses seven items to measure attitudes regarding each of the six love styles conceptualized by Lee (1973/1976). This particular general theory posits three primary love styles: (a) **eros**, which is romantic or passionate love, (b) **ludus**, which is game playing love, and (c) **storge**, which is friendship love. Lee suggested that three secondary styles are formed as compounds of the primary styles, but still have their own unique properties and characters: (d) **mania**, which is a compound of ludus and eros, (e) **pragma**, which is a compound of storge and ludus, and (f) **agape**, which is a compound of eros and storge.

The Hendrick-Hendrick measure has become increasingly popular. However, it is not entirely clear that the measure operationalizes a definition of love that social scientists should unequivocably

accept. The purpose of the present study was to investigate whether Lee's (1973/1976) model reasonably well fit responses to the Hendrick-Hendrick (1990) measure.

Methodological Premise of the Study

The development and revision of the Love Attitudes Scale has been guided by results typically involving data (a) from college students, (b) gathered using 5-point Likert-scales, and (c) subsequently analyzed using principal axes factor extraction followed by rotation to the varimax criterion. There is nothing intrinsically wrong with these choices, but it is important to remember that we prefer results that are invariant over defined variations in design, measurement, and analytic choices.

These considerations are particularly noteworthy when we recall that it is incorrect to say, "the test is valid", just as it is incorrect to say, "the test is reliable." As Thompson (1992, p. 436) emphasizes, this is not only a matter of statistical nit-picking:

> This is not just an issue of sloppy speaking--the problem is that sometimes we unconsciously come to think what we say or what we hear, so that sloppy speaking does sometimes lead to a more pernicious outcome, sloppy thinking and sloppy practice.

We need to know in what situations factor structures occur, so that we may know in what situations scores from our measures are reasonably valid. The importance of exploring factor structure across independent samples of subjects and variations in item pools

was noted by Gorsuch (1983, p. 335):

> To the extent that invariance can be found across systematic changes in *either variables or individuals* [or both], then the factors have a wider range of applicability as generalized constructs. The subpopulations over which the factor occurs could--and probably would--differ in their mean scores or variances across the groups, but the pattern of relationships among the variables would be the same.

The same considerations apply to measurement protocols and analytic strategies. The present study was conducted to explore invariance of model fit using confirmatory structural equation modelling, as against the exploratory orthogonal factor analyses emphasized in the development of this measure (S. Hendrick, C. Hendrick, Foote & Slapion-Foote, 1984; C. Hendrick & S. Hendrick, 1986, 1990).

Previous Empirical Research Raising Questions About the Lee Model

Two sets of questions bearing upon the Lee model have been raised in previous research. First, questions have been raised about the premise that the dimensions underlying perceptions of love are orthogonal. Second, questions have been raised about the factor dimensions themselves.

Questions About the Orthogonality of the Six Love Styles

Traditional analyses invoking varimax rotation implies a model in which the six constructs are uncorrelated. However, various empirical evidence has emerged across design, measurement, and

analytic choices in several studies to indicate that at least some of six love constructs are correlated with each other.

INSERT TABLE 1 ABOUT HERE

For example, Table 1 presents product-moment correlations, reported to two decimal places, among *summated scale scores* computed in two different studies. The correlation coefficients above the diagonal are product-moment correlation coefficients for Likert-scale ("1" to "5") data (n=391, variables=42) reported by C. Hendrick and S. Hendrick (1989) for the 1986 version of their measure. The below-diagonal entries are product-moment correlation coefficients for data reported by Thompson, Davenport and Wilkinson (1992, 1993). The latter data (n=185, v=42) were collected using an unnumbered graphic scale scored with 15-units (cf. Thompson & Dennings, 1993), and the 42 items in the study were from the 1990 version of the measure involving some wording changes in selected items. The Table 1 results indicate that scores on some scales (e.g., Agape and Eros, Agape and Mania) are correlated with each other.

A second line of evidence in this genre involves inter-*factor* correlation coefficients reported in previous studies. For example, Table 2 presents to three decimal places factor correlations from LISREL confirmatory maximum likelihood analyses of correlation matrices (Thompson & Borrello, 1990, 1992b) from data scored on a "1" to "10" scale. Below-diagonal maximum likelihood factor correlation coefficients were based on n=487

subjects responding to the v=18 items most highly correlated with their factors in previous research by the Hendricks with the 1986 version of their measure. The above-diagonal maximum likelihood factor correlation coefficients were based on a subset of n=227 subjects responding to v=20 items, i.e., the same 18 items plus one additional item each from the Agape and the Mania scales. Again, these results indicate that scores on some of the six constructs (e.g., Agape and Eros, Agape and Mania) are correlated with each other.

INSERT TABLE 2 ABOUT HERE

Questions About the Six Constructs Themselves

Several lines of inquiry also call into question whether the constructs should be measured as discrete entities, or even whether the model will fit response data. There is some empirical evidence that a model positing a more General or "G"-factor and a few additional nuance factors may better fit people's perceptions of love.

First, results from some *single-measure, first-order factor analyses* with various measures raise these questions. For example, C. Hendrick, S. Hendrick, Foote and Slapion-Foote (1984) themselves analyzed data from approximately 800 subjects and isolated a structure in which Mania, Agape and Pragma emerged as clearly identified constructs, but other love styles merged and it was unclear whether Eros was defined at all. This led to the revision of items reported by C. Hendrick and S. Hendrick (1986).

Thompson and Borrello (1987b) employed the v=18 items most highly correlated with the factors reported in previous research by the Hendricks presenting the 1986 version of their measure. Data were collected from 260 subjects using a "1" to "10" scale. Five principal axes factors were extracted. Though Eros, Storge, Ludus and Pragma emerged as discrete dimensions in this analysis, Agape and Mania items collapsed into a single factor. However, when in a subsequent study (Borrello & Thompson, 1990b) one additional item was used to measure Agape and Mania (v=20, n=225), the six expected factors were isolated.

On the other hand, Sternberg and Grajek (1984) report results from another measure suggesting that love is a "G"-factor or "Thomsonian" phenomenon in which one dimension (apparently involving obsessive thought) dominates meaning. Similar findings have emerged in previous work (cf. Thompson & Borrello, 1987b) using still another measure, a measure based on Tennov's (1979) work.

Thompson, Davenport and Wilkinson (1993) used data from 185 subjects to explore the fit of various models involving responses to the 42 items from the 1990 version of the Hendrick-Hendrick measure. Data were collected using a 1-to-15 unit unnumbered graphic scale. The variance-covariance matrix was the basis for these LISREL analyses (Jöreskog & Sörbom, 1989).

The *a priori* model positing the existence of six uncorrelated factors yielded a χ^2 of 1770.63 (df = 819; noncentrality parameter = 1770.63 - 819 = 951.63; 951.63/819 = 1.16). The LISREL goodness-

of-fit index (GFI) was .66. The parsimony ratio (Mulaik, James, Van Alstine, Bennett, Lind & Stilwell, 1989) associated with the GFI was .91; the parsimonious GFI (i.e., the PGFI = GFI times the parsimony ratio) was .60. The Bentler (1990, in press) comparative fit index (CFI) was .62 (((3390.60 - 861) - (1770.63 - 819)) / (3390.60 - 861)). The parsimony ratio associated with the CFI was .95; the parsimonious CFI (PCFI) was .59. Thompson, Davenport and Wilkinson (1993, p. 6) concluded that:

> These results would not make one sanguine about the fit of any of the three models to our data. Indeed, the model recommended in much of the previous research with the Hendrick-Hendrick measure is Model 1, and it is a candidate for worst fitting model. For example, Model 1 had the largest noncentrality-to-degrees-of-freedom ratio and the worst comparative fit index.

Second, results from *single-measure, second-order* factor analyses raise these questions. It does appear that an orthogonal, first-order exploratory model can be fit to data to yield interpretable results. This has been true across an array of studies reported for various versions of the measure, using principal factor axes extraction and varimax rotation (cf. C. Hendrick & S.S. Hendrick, 1990; S.S. Hendrick & C. Hendrick, 1987a). However, results such as those reported in Tables 1 and 2 do suggest the possibility that the love style constructs may reasonably be freed to correlate.

As Gorsuch (1983) noted, non-zero factor correlation coefficients imply "...that the factors do overlap and that there are, therefore, broader areas of generality than just a primary factor. Implicit in all oblique rotations are higher-order factors" (p. 255) that can and be should identified. Borrello and Thompson (1990b) computed a second-order exploratory factor analysis invoking a Schmid-Leiman solution and other important interpretation aids (Thompson, 1990). They reanalyzed the responses of n=487 subjects on the v=18 items most highly correlated with the six love-styles factors reported in previous research by the Hendricks with the 1986 version of their measure, and also data from n=227 subjects responding to v=20 items from the 1986 measure. In both analyses, Mania and Agape items constituted one of three second-order factors.

Using the inter-item correlation matrix, Thompson and Borrello (1992b) also fit a confirmatory second-order model to the responses of n=487 subjects on the v=18 items most highly correlated with the six love-styles factors in previous research by the Hendricks with the 1986 version of their measure. Mania and Agape had the two highest loadings on the second-order factor.

Third, results from some *multiple-measure studies* using some version of the Hendrick-Hendrick measure raise questions about structure. For example, in one study C. Hendrick and S. Hendrick (1989) employed data (n=391) from the 1986 version of their measure ($v$ariables=42), as well as from four related instruments. In this study the Hendricks extracted principal components from the

correlation matrix involving scores on 19 *scales* (as against items) from the five measures, and rotated five factors to the varimax criterion. The first component accounted for 32% of the trace after rotation, and 12 of the 19 scales were deemed salient (r_s > |.35|) to this factor. Eros, Agape and Mania were the love-styles scales deemed salient to this component.

Thompson and Borrello (1987b) employed the $\underline{v}$=18 items most highly correlated with the factors reported in previous research by the Hendricks for the 1986 version of their measure. Data were collected from 260 subjects, who also completed a measure grounded in Tennov's (1979) work. Both canonical correlation analysis and interbattery factor analysis were employed to explore relationships between factor scores from the two measures. G-factor dynamics involving components of obsessive thought appeared to dominate the solution space.

Thompson, Davenport and Wilkinson (1992) used the 1990 version of the Hendricks' measure to collect data ($\underline{n}$=185, $\underline{v}$=42) with an unnumbered graphic scale scored involving 15-units. The researchers also administered two related measures, including Sternberg's (1988, pp. 99-100) Triangular Love Scale. Principal components were extracted for each measure, factor scores were computed, and then canonical correlation analyses of the relationships among the factor scores were conducted. The authors concluded that:

> When the participants in our study think of love, a pervasive omnipresence of the loved person in one's

mental life appears to be an important aspect of the experience of love. The results suggest that this dimension somewhat dominates perceptions of love, though other factors and functions do delineate nuances about this conceptualization. (p. 15)

Method

Participants in the present study were 499 students enrolled in various undergraduate courses at a large land-grant university. The mean age was 21.16 (SD=3.10). There were more females (82.0%) than males in the study. Most of the participants were nonminority students (90.0%), though 28 participants were Hispanic (5.6%) and 11 were African-American (2.2%). Scores on the 42 C. Hendrick and S. Hendrick (1990) items were collected using a "1"-to-"7" Likert-scale response format.

Results

The *a priori* Models

Five *a priori* models were evaluated in the present study. Model 1 posited the six uncorrelated factors (7 items/factor) reported by the Hendricks in their previous work. Model 2 posited the six factors (7 items/factor) reported by the Hendricks, but allowed the factors to be correlated. Model 3 posited five factors that were allowed to be correlated, with Mania and Agape (7 + 7 = 14 items) defining a single "G"-factor. This model was derived based on previous work (e.g., Thompson & Borrello, 1990) suggesting that the Mania and Agape factors are highly correlated and may constitute basically a single dimension that dominates the factor

space.

Models 4 and 5 were developed in the previous study reported by Thompson, Davenport and Wilkinson (1993) using data from 185 subjects to explore the fit of various models involving responses to the 42 items from the 1990 version of the Hendrick-Hendrick measure. Data in the previous study were collected using a 1-to-15 unit unnumbered graphic scale. The variance-covariance matrix was the basis for these LISREL analyses.

Models 4 and 5 were developed in that previous study in an exploratory manner, primarily based on examination of model modification indices. Model 4 was the same as Model 2, except that 16 additional factor loadings (42 + 16 = 58) were freed. Model 5 was the same as Model 4, except that 5 previously freed factor-parameter estimates were again fixed to be zeroes (58 - 5 = 53).

Model Fit Statistics

A host of fit statistics can be consulted to help us evaluate the fit of our construct definitions to data. These statistics include the LISREL goodness-of-fit index (GFI), the parsimonious GFI (PGFI), the Bentler (1990) comparative fit index (CFI), and the parsimonious CFI (PCFI), among others.

With respect to the relative utility of GFI versus CFI indices, though they are grounded in different theory, they often yield comparable results (Mulaik et al., 1989). But GFI evaluates fit to both the variances and the covariances of the observed variables, while CFI evaluates fit to only the covariances among the observed variables. As researchers employ more observed

variables, the ratio of the v diagonal entries in the covariance matrix to the (v * (v - 1) / 2) off-diagonal matrix entries decreases rapidly, so to some extent the two indices may tend to be more similar in these circumstances.

With respect to the indices ignoring model parsimony as against those considering it (Mulaik et al., 1989), it seems reasonable to place more emphasis on indices that evaluate the parsimony of the models that we are testing. When we "free" a parameter in a confirmatory analysis, we get an exact fit to the data for this estimate. Fit, then, is partially a function of how many parameters we free. Our most realistic estimates of fit arise when we try to fit the parameters we want to emphasize from one study to the data from another study, so that fit is less artifactual. Indices that consider model parsimony give credit for evaluating the invariance across studies of the parameter estimates we wish to interpret, by favoring models with more degrees of freedom.

The Tests of Fit

In the present study models were tested using the variance-covariance matrix (Cudeck, 1989). Table 3 presents the fit statistics associated with the five *a priori* models, as well as the comparable results from the Thompson, Davenport and Wilkinson (1993) study.

INSERT TABLE 3 ABOUT HERE

As in the previous study (Thompson, Davenport & Wilkinson,

1993), in the present study Model 1, the model implied by varimax rotation in exploratory factor analysis, was a candidate for the worst fitting of the five models. Model 5 was again a candidate for the best fitting model.

Table 4 presents the factor loadings for Model 5 in the present study (n=499, v=42) and in a previous study (Thompson, Davenport & Wilkinson, 1993; n=185, v=42). Table 5 presents the correlations among the factor for Model 5 in both studies.

INSERT TABLES 4 AND 5 ABOUT HERE

We also tried to fit the specific parameters from our previous study for these five models, so that the model would have considerably more parsimony. We were unsuccessful in doing so, since the resulting estimates of the parameter sigma matrix were not positive definite. We were also again troubled that in the present study none of models yield fit statistics that would make one sanguine about having identified a well-fitting model.

Ancillary Model Tests

In a previous study (Thompson & Borrello, 1990) with fewer items (v=20 and v=18), much more positive fit statistics were reported for tests of the analog of Model 2 based on inter-item correlation matrices. For example, in an analysis involving 227 subjects' responses to v=20 items, the goodness-of-fit index was .913 (χ^2=217.92, df=155). In an analysis involving 487 subjects' responses to v=18 items, the goodness-of-fit index was .938 (χ^2=285.92, df=120).

We inferred that the use of the expanded set of 42 items might result in a more factorially complex structure, and that the six-factor model might better the data involving fewer items. To explore this possibility we therefore conducted two ancillary analyses, also using inter-item correlation matrices. First, we fit a model (df=155) positing six correlated factors with 20 factor loadings freed, the 15 factor correlations freed, and the 20 theta delta measurement error estimates freed. Second, we used a related model (df=190), but we fixed the 20 factor loadings and the 15 factor correlation coefficients, using the results for these coefficients from our previous study (Thompson & Borrello, 1990). The fit statistics from these analyses are reported in Table 3, respectively.

Discussion

Love is fundamental to the experience of being human. Sisca, Walsh and Walsh (1985) even note that, "love deprivation has frequently been linked epidemiologically [by researchers] to a variety of psychological syndromes" (p. 63), including psychopathology, neuroses and hysteria. Our current state of understanding is very limited, partly because traditionally it has not been considered scientifically respectable to conduct inquiry in this area.

We do not even have widely acceptable definitions of relevant constructs. As Elkins and Smith (1979, p. 10) have observed, "It is apparent that the ambiguity, abstractness, and disagreement that surround love phenomena have inhibited a generalizable

understanding of love among behavioral scientists."

Confirmatory analytic methods were employed in the present study. Exploratory factor analysis yields indeterminate common factors, so even if methods could somehow create meaning or define constructs, certainly exploratory common factor analysis can not do so. As Mulaik (1987, p. 301) emphasizes, "It is we who create meanings for things in deciding how they are to be used. Thus we should see the folly of supposing that exploratory factor analysis will teach us what intelligence is, or what personality is." Confirmatory analysis forces us to do the best job we can of creating the meaning of our constructs, presumably using available theory and previous empirical research. The latent variables we define then represent a more objective conception of our constructs.

Our reading of the present results is that they are consistent with some of our previous results with this measure, with our results with other measures, and with some of the findings in research by others (cf. Sternberg & Grajek, 1984). These and related results are the basis for our strongly arguing, first, that we should not define the love styles as uncorrelated constructs, as we do when we employ varimax rotation.

Second, the results reported in Tables 3, 4 and 5 provide some basis, though they are primarily suggestive, for arguing that love may involve a slightly different structure than that postulated by Lee (1973/1977). However, this conclusion is tempered by the recognition that exploratory orthogonal factors have provided

interpretable results in studies that have varied measurement strategies, samples, and items (cf. Borrello & Thompson, 1990b; S. Hendrick & C. Hendrick, 1987a). Furthermore, it is noteworthy that a model positing the six love styles as correlated constructs does in some cases fit data involving a smaller item set, as reported in Table 3.

What is needed at this juncture are tests of more alternative models and replications in which the parameters like those reported here are fit to data in new samples. Replications in which more model parameters are fixed have more degrees of freedom, meaning there are more ways in which the models are potentially falsifiable, and so represent more rigorous tests of our conceptions of latent constructs (Mulaik, 1987, 1988).

The Hendricks have noted that:

> Love is simply too unruly to be categorized so easily.... Only with patient, open-minded exploration of several of the current approaches to love will we have any possibility of developing the overarching theory of love that still eludes us. (C. Hendrick & S. Hendrick, 1989, p. 793)

The present study represents one additional step toward realizing the desired insights regarding the structure of these important phenomena.

References

Bentler, P.M. (1990). Comparative fit indices in structural models. Psychological Bulletin, 107, 238-246.

Bentler, P.M. (in press). On the quality of test statistics in covariance structure analysis: Caveat emptor. In C.R. Reynolds (Ed.), Advances in cognitive assessment: An interdisciplinary perspective. New York: Plenum.

Borrello, G.M., & Thompson, B. (1990a). An hierarchical analysis of the Hendrick-Hendrick measure of Lee's typology of love. Journal of Social Behavior and Personality, 3, 327-342.

Borrello, G.M., & Thompson, B. (1990b). A note regarding the validity of Lee's typology of love. Journal of Psychology, 124(6), 639-644.

Cudeck, R. (1989). The analysis of correlation matrices using covariance structure models. Psychological Bulletin, 105, 317-327.

Curtin, M. E. (1973). Symposium on love. New York: Behavioral Publications.

Elkins, G. R., & Smith, D. (1979). Meaning and measurement of love: A review of humanistic and behavioral approaches. The Humanist Educator, 18(1), 7-14.

Finding out the meaning of true love. (1992, December 22). USA Today, Section D, p. 1.

Freud, S. (1924). On narcissism. In J. Rivier & J. Strachy (Eds.), Collected papers of Sigmund Freud. New York: International Psychoanalytic Press.

Gorsuch, R.L. (1983). Factor analysis (2nd ed.). Hillsdale, NJ:

Erlbaum.

Gray, P. (1993, February 15). What is love? [Cover story]. Time, 141(7), 46-49.

Hendrick, C., & Hendrick, S. (1986). A theory and method of love. Journal of Personality and Social Psychology, 50, 392-402.

Hendrick, C., & Hendrick, S. (1989). Research on love: Does it measure up? Journal of Personality and Social Psychology, 56, 784-794.

Hendrick, C., & Hendrick, S.S. (1990). A relationship-specific version of the Love Attitudes Scale. Journal of Social Behavior and Personality, 5, 239-254.

Hendrick, C., Hendrick, S., Foote, F. H., & Slapion-Foote, M. J. (1984). Do men and women love differently? Journal of Social and Personal Relationships, 1, 177-195.

Hendrick, S.S., & Hendrick, C. (1987a). Love and sex attitudes: A close relationship. In W.H. Jones & D. Perlman (Eds.), Advances in personal relationships (Vol. 1, pp. 141-169). Greenwich, CT: JAI Press.

Hendrick, S.S., & Hendrick, C. (1987b). Love and sexual attitudes, self-disclosure and sensation seeking. Journal of Social and Personal Relationships, 4, 281-297.

Jöreskog, K.G., & Sörbom, D./SPSS. (1989). LISREL 7: A guide to the program and applications (2nd ed.). Chicago: SPSS.

Lee, J. A. (1973). The colors of love: An exploration of the ways of loving. Don Mills, Ontario: New Press. (Popular Edition, 1976)

Mulaik, S.A. (1987). A brief history of the philosophical

foundations of exploratory factor analysis. Multivariate Behavioral Research, 22, 267-305.

Mulaik, S.A. (1988). Confirmatory factor analysis. In R.B. Cattell & J.R. Nesselroade (Eds.), Handbook of multivariate experimental psychology. New York: Plenum.

Mulaik, S.A., James, L.R., van Alstine, J., Bennett, N., Lind, S., & Stilwell, C.D. (1989). Evaluation of goodness-of-fit indices for structural equation models. Psychological Bulletin, 105, 430-445.

Rubin, Z. (1984). Toward a science of relationships. Contemporary Psychology, 29, 856-858.

Sisca, S.S., Walsh, A., & Walsh, P.A. (1985). Love deprivation and blood pressure levels among a college population: A preliminary investigation. Psychology: A Quarterly Journal of Human Behavior, 22, 63-70.

Sternberg, R.J. (1988). The triangle of love. New York: Basic Books.

Sternberg, R. J., & Grajek, S. (1984). The nature of love. Journal of Personality and Social Psychology, 47, 312-329.

Tennov, D. (1979). Love and limerance: The experience of being in love. New York: Stein and Day.

Thompson, B. (1990). SECONDOR: A program that computes a second-order principal components analysis and various interpretation aids. Educational and Psychological Measurement, 50, 575-580.

Thompson, B. (1992). Two and one-half decades of leadership in measurement and evaluation. Journal of Counseling and

Development, 70, 434-438.

Thompson, B., & Borrello, G. M. (1987a, January). Comparisons of factors extracted from the correlation matrix versus the covariance matrix: An example using the Love Relationships Scale. Paper presented at the annual meeting of the Southwest Educational Research Association, Dallas. (ERIC Document Reproduction Service No. ED 280 862)

Thompson, B., & Borrello, G. (1987b). Concurrent validity of a love relationships scale. Educational and Psychological Measurement, 47, 985-995.

Thompson, B., & Borrello, G.M. (1990, November). Measuring second-order factors using confirmatory methods: A case study example with the Hendrick-Hendrick love instrument. Paper presented at the annual meeting of the Mid-South Educational Research Association, New Orleans. (ERIC Document Reproduction Service No. ED 325 527)

Thompson, B., & Borrello, G. (1992a). Different views of love: Deductive and inductive lines of inquiry. Current Directions in Psychological Science, 1(5), 154-156.

Thompson, B., & Borrello, G.M. (1992b). Measuring second-order factors using confirmatory methods: An illustration with the Hendrick-Hendrick love instrument. Educational and Psychological Measurement, 52, 69-77.

Thompson, B., Davenport, D., & Wilkinson, R. (1992, March). Romantic love: Theories, findings, and various measurement strategies. Paper presented at the annual meeting of the American Association for Counseling and Development, Baltimore.

Thompson, B., Davenport, D., & Wilkinson, R. (1993, April). Perceptions of romantic love and their implications for counseling. Paper presented at the annual meeting of the American Educational Research Association, Atlanta.

Thompson, B., & Dennings, B. (1993, November). The unnumbered graphic scale as a data-collection method: An investigation comparing three measurement strategies in the context of Q-technique factor analysis. Paper presented at the annual meeting of the Mid-South Educational Research Association, New Orleans.

Wrightsman, L. S., & Deaux, K. (1981). Social psychology in the 80s. Monterey, CA: Brooks/Cole.

Table 1
Pearson Product-Moment Correlation Coefficients
Among *Summated Scale Scores* Across Two Studies

Scale	Eros	Ludus	Storge	Pragma	Mania	Agape
Eros	.73	-22	-05	-04	22	36
Ludus	-.29	.71	-11	14	-14	-37
Storge	.18	-.16	.75	24	-05	16
Pragma	.00	.20	.17	.71	07	02
Mania	.34	.05	-.02	.19	.75	37
Agape	.53	-.28	.30	.07	.49	.84

Note. Correlation coefficients involving pairwise combinations of the Eros, Mania, and Agape *scales* are underlined. Coefficients alpha (reported with decimals) associated with data (n=185, variables=42) from by Thompson, Davenport and Wilkinson (1992, 1993) are presented on the diagonal. Above-diagonal entries (reported without decimals) were from data (n=391, v=42) reported by C. Hendrick and S. Hendrick (1989). Below-diagonal entries (reported with decimals) were from data (n=185, variables=42) from data reported by Thompson, Davenport and Wilkinson (1992, 1993).

Table 2
Maximum Likelihood *Factor* Correlation Coefficients
Across Two Sets of Subjects

Factor	Eros	Ludus	Storge	Pragma	Mania	Agape
Eros		-.263	.104	.105	.066	.328
Ludus	-.238		.038	.394	.342	-.188
Storge	.067	.077		.215	.036	.018
Pragma	.125	.335	.234		.425	.148
Mania	.165	.358	.061	.404		.534
Agape	.385	-.128	.105	.321	.645	

Note. The inter-item correlation matrices upon which these were results were based are available to readers in the appendices of Thompson and Borrello (1990). Correlation coefficients involving pairwise combinations of the Eros, Mania, and Agape *factors* are underlined. Above-diagonal entries involved n=227 and variables=20; below-diagonal entries involved n=487 and v=20.

Table 3
Model Fit Statistics

Statistic	Model 1	2	3	4	5
Present Study					
variables	42	42	42	42	42
Null χ^2	5970.45	5970.45	5970.45	5970.45	5970.45
Null df	861	861	861	861	861
Noncentrality	5109.45	5109.45	5109.45	5109.45	5109.45[a]
Model χ^2	2729.42	2329.72	2573.73	2023.24	2049.44
Model df	819	804	809	788	793
Noncentrality	1910.42	1525.72	1764.73	1235.24	1256.44[a]
NC / df	2.33	1.90	2.18	1.57	1.58[b]
GFI	0.760	0.802	0.772	0.832	0.830
Parsimony Ratio	0.907	0.890	0.896	0.873	0.878[c]
GFI*Parsimony	0.689	0.714	0.692	0.726	0.729[d]
CFI	0.626	0.701	0.655	0.758	0.754[e]
Parsimony Ratio	0.951	0.934	0.940	0.915	0.921[f]
CFI*Parsimony	0.596	0.655	0.615	0.694	0.695[g]
Thompson, Davenport & Wilkinson (1993)					
variables	42	42	42	42	42
Null χ^2	3390.60	3390.60	3390.60	3390.60	3390.60
Null df	861	861	861	861	861
Noncentrality	2529.60	2529.60	2529.60	2529.60	2529.60[a]
Model χ^2	1770.63	1560.10	1713.42	1287.34	1292.26
Model df	819	804	809	788	793
Noncentrality	951.63	756.10	904.42	499.34	499.26[a]
NC / df	1.16	0.94	1.12	0.63	0.63[b]
GFI	0.659	0.702	0.656	0.755	0.754
Parsimony Ratio	0.907	0.890	0.896	0.873	0.878[c]
GFI*Parsimony	0.598	0.625	0.588	0.659	0.662[d]
CFI	0.624	0.701	0.642	0.803	0.803[e]
Parsimony Ratio	0.951	0.934	0.940	0.915	0.921[f]
CFI*Parsimony	0.593	0.655	0.604	0.735	0.739[g]

Statistic	Present Study--Ancillary Analyses 1	2
variables	20	20
Null χ^2	2275.95	2275.95
Null df	190	190
Noncentrality	2085.95	2085.95[a]
Model χ^2	476.26	681.76
Model df	155	190
Noncentrality	321.26	491.76[a]
NC / df	2.07	2.59[b]
GFI	0.909	0.870
Parsimony Ratio	0.738	0.905[c]
GFI*Parsimony	0.671	0.787[d]
CFI	0.846	0.764[e]
Parsimony Ratio	0.816	1.000[f]
CFI*Parsimony	0.690	0.764[g]

[a]Noncentrality = χ^2 - df

[b]Noncentrality / df

[c]Parsimony Ratio = Model df / [(variables * (variables + 1)) / 2]

[d]GFI * Parsimony Ratio

[e]$$\text{CFI} = \frac{[(\text{Null } \chi^2 - \text{Null df}) - (\text{Model } \chi^2 - \text{Model df})]}{(\text{Null } \chi^2 - \text{Null df})}$$

[f]Parsimony Ratio = Model df / [(variables * (variables - 1)) / 2]

[g]CFI * Parsimony Ratio

Table 4
Items Sorted by Factor and by Their |Loadings| for Model 5

Study		Loading	Item/ (Item Classification)
Present	Prior		
+1.115	+3.135	19.	I feel that my lover and I were meant for each other. *(Eros)*
+0.758	+2.181	31.	My lover and I really understand each other. *(Eros)*
+0.718	+2.535	10.	My lover and I have the right physical "chemistry" between us. *(Eros)*
-0.655	-1.468	22.	I could get over my love affair with my lover pretty easily and quickly. *(Ludus)*
+0.604	+1.761	37.	My lover fits my ideal standards of physical beauty/handsomeness. *(Eros)*
+0.586	+1.979	15.	I expect to always be friends with my lover. *(Storge)*
+0.548	+2.307	13.	Our lovemaking is very intense and satisfying. *(Eros)*
+0.447	+1.056	36.	When my lover gets angry with me, I still love him/her fully and unconditionally. *(Agape)*
-0.319	-1.335	27.	Our friendship merged gradually into love over time. *(Storge)*
+0.245	+0.978	1.	My lover and I were attracted to each other immediately after we first met. *(Eros)*
+0.207	+1.183	25.	My lover and I became emotionally involved rather quickly. *(Eros)*
+0.165	+0.961	6.	I try to always help my lover through difficult times. *(Agape)*
+1.179	+2.385	26.	My lover would get upset if he/she knew of some of the things I've done with other people. *(Ludus)*
+1.173	+2.647	14.	I have sometimes had to keep my lover from finding out about other lovers. *(Ludus)*
+1.023	+2.971	2.	I try to keep my lover a little uncertain about my commitment to him/her. *(Ludus)*
+1.008	+2.619	7.	I believe that what my lover doesn't know about me won't hurt him/her. *(Ludus)*
+0.733	+1.086	34.	When my lover gets too dependent on me, I want to back off a little. *(Ludus)*
+0.561	+1.927	38.	I enjoy playing the "game of love" with my lover and a number of other partners. *(Ludus)*
+0.396	+1.023	22.	I could get over my love affair with my lover pretty easily and quickly. *(Ludus)*
-0.218	-1.747	5.	When things aren't right with my lover and me, my stomach gets upset. *(Mania)*
+0.042	+1.183	24.	I am usually willing to sacrifice my own wishes to let my lover achieve his/hers. *(Agape)*

+1.610	+3.567	20.	Our love is the best kind because it grew out of a long friendship. *(Storge)*
+1.509	+3.473	39.	Our love relationship is the most satisfying because it developed from a good friendship. *(Storge)*
+1.463	+3.798	27.	Our friendship merged gradually into love over time. *(Storge)*
+0.631	+2.024	32.	Our love is really a deep friendship, not a mysterious, mystical emotion. *(Storge)*
+0.511	+1.618	11.	To be genuine, our love first required caring for awhile. *(Storge)*
+0.328	+1.193	3.	It is hard for me to say exactly when our friendship turned into love. *(Storge)*
+0.255	+1.086	31.	My lover and I really understand each other. *(Eros)*
+0.166	+0.653	15.	I expect to always be friends with my lover. *(Storge)*
+1.249	`.165	40.	Before getting very involved with my lover, I tried to figure out how compatible his/her hereditary background would be with mine in case we ever had children. *(Pragma)*
+1.230	+2.769	23.	A main consideration in choosing my lover was how he/she would reflect on my family. *(Pragma)*
+1.028	+2.351	35.	One consideration in choosing my lover was how he/she would reflect on my career. *(Pragma)*
+0.934	+2.324	4.	I considered what my lover was going to become in life before I committed myself to him/her. *(Pragma)*
+0.897	+2.524	16.	In choosing my lover, I believed it was best to love someone with a similar background. *(Pragma)*
+0.847	+2.361	28.	An important factor in choosing my lover was whether or not he/she would be a good parent. *(Pragma)*
+0.656	+1.611	8.	I tried to plan my life carefully before choosing a lover. *(Pragma)*
+1.071	+2.665	29.	Since I've been in love with my lover, I've had trouble concentrating on anything else. *(Mania)*
+1.001	+3.202	21.	When my lover doesn't pay attention to me, I feel sick all over. *(Mania)*
+0.859	+3.459	17.	Sometimes I get so excited about being in love with my lover that I can't sleep. *(Mania)*
+0.828	+1.979	33.	I cannot relax if I suspect that my lover is with someone else. *(Mania)*
+0.810	+2.601	41.	If my lover ignores me for a while, I sometimes do stupid things to try to get his/her attention back. *(Mania)*
+0.658	+2.322	5.	When things aren't right with my lover and me, my stomach gets upset. *(Mania)*

+0.444	+1.433	12.	If my lover and I break up, I would get so depressed that I would even think of suicide. *(Mania)*
+0.358	+1.462	18.	I cannot be happy unless I place my lover's happiness before my own. *(Agape)*
-0.304	-0.767	36.	When my lover gets angry with me, I still love him/her fully and unconditionally. *(Agape)*
-0.138	-0.824	6.	I try to always help my lover through difficult times. *(Agape)*
+1.391	+3.555	42.	I would endure all things for the sake of my lover. *(Agape)*
+1.054	+2.825	30.	Whatever I own is my lover's to use as he/she chooses. *(Agape)*
+1.000	+2.784	24.	I am usually willing to sacrifice my own wishes to let my lover achieve his/hers. *(Agape)*
+0.925	+2.853	9.	I would rather suffer myself than let my lover suffer. *(Agape)*
+0.879	+2.018	18.	I cannot be happy unless I place my lover's happiness before my own. *(Agape)*
+0.386	+2.014	36.	When my lover gets angry with me, I still love him/her fully and unconditionally. *(Agape)*
+0.234	+1.155	6.	I try to always help my lover through difficult times. *(Agape)*

Table 5
LISREL Maximum Likelihood Estimates of the Model 5 Matrix of Factor Relationships

	Factor					
Factor	Eros	Ludus	Storge	Pragma	Mania	Agape
Eros		-0.416	0.291	-0.064	0.237	0.597
Ludus	-0.460		-0.255	0.290	0.226	-0.332
Storge	0.271	-0.246		0.259	-0.047	0.322
Pragma	0.069	0.062	0.124		0.253	0.062
Mania	0.076	0.253	-0.049	0.335		0.551
Agape	0.621	-0.300	0.169	0.144	0.434	

Note. Correlation coefficients above the diagonal were for data (n=185, v=42) reported by Thompson, Davenport and Wilkinson (1993). Correlation coefficients below the diagonal are for the data (n=499, v=42) from the present study.

Appendix A.1
Factor Structure for Model 1
(n=499, v=42)

LAMBDA X

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
E0101	0.237	0.000	0.000	0.000	0.000	0.000
L0802	0.000	0.929	0.000	0.000	0.000	0.000
S1503	0.000	0.000	0.357	0.000	0.000	0.000
P2204	0.000	0.000	0.000	0.926	0.000	0.000
M2905	0.000	0.000	0.000	0.000	0.678	0.000
A3606	0.000	0.000	0.000	0.000	0.000	0.272
L0907	0.000	1.054	0.000	0.000	0.000	0.000
P2308	0.000	0.000	0.000	0.651	0.000	0.000
A3709	0.000	0.000	0.000	0.000	0.000	0.946
E0210	0.765	0.000	0.000	0.000	0.000	0.000
S1611	0.000	0.000	0.491	0.000	0.000	0.000
M3012	0.000	0.000	0.000	0.000	0.420	0.000
E0313	0.555	0.000	0.000	0.000	0.000	0.000
L1014	0.000	1.249	0.000	0.000	0.000	0.000
S1715	0.000	0.000	0.298	0.000	0.000	0.000
P2416	0.000	0.000	0.000	0.898	0.000	0.000
M3117	0.000	0.000	0.000	0.000	0.853	0.000
A3818	0.000	0.000	0.000	0.000	0.000	1.052
E0419	1.096	0.000	0.000	0.000	0.000	0.000
S1820	0.000	0.000	1.641	0.000	0.000	0.000
M3221	0.000	0.000	0.000	0.000	1.030	0.000
L1122	0.000	0.682	0.000	0.000	0.000	0.000
P2523	0.000	0.000	0.000	1.244	0.000	0.000
A3924	0.000	0.000	0.000	0.000	0.000	1.026
E0525	0.159	0.000	0.000	0.000	0.000	0.000
L1226	0.000	1.230	0.000	0.000	0.000	0.000
S1927	0.000	0.000	1.367	0.000	0.000	0.000
P2628	0.000	0.000	0.000	0.833	0.000	0.000
M3329	0.000	0.000	0.000	0.000	1.053	0.000
A4030	0.000	0.000	0.000	0.000	0.000	1.017
E0631	0.820	0.000	0.000	0.000	0.000	0.000
S2032	0.000	0.000	0.588	0.000	0.000	0.000
M3433	0.000	0.000	0.000	0.000	0.824	0.000
L1334	0.000	0.651	0.000	0.000	0.000	0.000
P2735	0.000	0.000	0.000	1.024	0.000	0.000
A4136	0.000	0.000	0.000	0.000	0.000	0.512
E0737	0.606	0.000	0.000	0.000	0.000	0.000
L1438	0.000	0.531	0.000	0.000	0.000	0.000
S2139	0.000	0.000	1.520	0.000	0.000	0.000
P2840	0.000	0.000	0.000	1.256	0.000	0.000
M3541	0.000	0.000	0.000	0.000	0.807	0.000
A4242	0.000	0.000	0.000	0.000	0.000	1.363

CHI-SQUARE WITH 819 DEGREES OF FREEDOM = 2729.42 (P = .000)
GOODNESS OF FIT INDEX =0.760
ADJUSTED GOODNESS OF FIT INDEX =0.735
ROOT MEAN SQUARE RESIDUAL = 0.318

Appendix A.2
Factor Structure for Model 2
(n=499, v=42)

LAMBDA X

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
E0101	0.185	0.000	0.000	0.000	0.000	0.000
L0802	0.000	1.080	0.000	0.000	0.000	0.000
S1503	0.000	0.000	0.330	0.000	0.000	0.000
P2204	0.000	0.000	0.000	0.938	0.000	0.000
M2905	0.000	0.000	0.000	0.000	0.628	0.000
A3606	0.000	0.000	0.000	0.000	0.000	0.286
L0907	0.000	0.966	0.000	0.000	0.000	0.000
P2308	0.000	0.000	0.000	0.659	0.000	0.000
A3709	0.000	0.000	0.000	0.000	0.000	0.918
E0210	0.699	0.000	0.000	0.000	0.000	0.000
S1611	0.000	0.000	0.502	0.000	0.000	0.000
M3012	0.000	0.000	0.000	0.000	0.430	0.000
E0313	0.512	0.000	0.000	0.000	0.000	0.000
L1014	0.000	1.030	0.000	0.000	0.000	0.000
S1715	0.000	0.000	0.325	0.000	0.000	0.000
P2416	0.000	0.000	0.000	0.902	0.000	0.000
M3117	0.000	0.000	0.000	0.000	0.874	0.000
A3818	0.000	0.000	0.000	0.000	0.000	1.022
E0419	1.125	0.000	0.000	0.000	0.000	0.000
S1820	0.000	0.000	1.623	0.000	0.000	0.000
M3221	0.000	0.000	0.000	0.000	1.019	0.000
L1122	0.000	0.854	0.000	0.000	0.000	0.000
P2523	0.000	0.000	0.000	1.231	0.000	0.000
A3924	0.000	0.000	0.000	0.000	0.000	0.969
E0525	0.119	0.000	0.000	0.000	0.000	0.000
L1226	0.000	1.014	0.000	0.000	0.000	0.000
S1927	0.000	0.000	1.348	0.000	0.000	0.000
P2628	0.000	0.000	0.000	0.842	0.000	0.000
M3329	0.000	0.000	0.000	0.000	1.081	0.000
A4030	0.000	0.000	0.000	0.000	0.000	1.060
E0631	0.867	0.000	0.000	0.000	0.000	0.000
S2032	0.000	0.000	0.615	0.000	0.000	0.000
M3433	0.000	0.000	0.000	0.000	0.795	0.000
L1334	0.000	0.808	0.000	0.000	0.000	0.000
P2735	0.000	0.000	0.000	1.032	0.000	0.000
A4136	0.000	0.000	0.000	0.000	0.000	0.556
E0737	0.592	0.000	0.000	0.000	0.000	0.000
L1438	0.000	0.567	0.000	0.000	0.000	0.000
S2139	0.000	0.000	1.529	0.000	0.000	0.000
P2840	0.000	0.000	0.000	1.240	0.000	0.000
M3541	0.000	0.000	0.000	0.000	0.806	0.000
A4242	0.000	0.000	0.000	0.000	0.000	1.389

PHI

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
EROS	1.000					
LUDUS	-0.571	1.000				
STORGE	0.305	-0.250	1.000			
PRAGMA	0.117	0.079	0.114	1.000		
MANIA	0.076	0.166	-0.022	0.340	1.000	
AGAPE	0.646	-0.401	0.164	0.146	0.442	1.000

CHI-SQUARE WITH 804 DEGREES OF FREEDOM = 2329.72 (P = .000)
GOODNESS OF FIT INDEX =0.802
ADJUSTED GOODNESS OF FIT INDEX =0.778
ROOT MEAN SQUARE RESIDUAL = 0.248

Appendix A.3
Factor Structure for Model 3
(n=499, v=42)

LAMBDA X

	EROS	LUDUS	STORGE	PRAGMA	MANIAGAP
E0101	0.196	0.000	0.000	0.000	0.000
L0802	0.000	1.065	0.000	0.000	0.000
S1503	0.000	0.000	0.331	0.000	0.000
P2204	0.000	0.000	0.000	0.939	0.000
M2905	0.000	0.000	0.000	0.000	0.288
A3606	0.000	0.000	0.000	0.000	0.268
L0907	0.000	0.970	0.000	0.000	0.000
P2308	0.000	0.000	0.000	0.663	0.000
A3709	0.000	0.000	0.000	0.000	0.921
E0210	0.707	0.000	0.000	0.000	0.000
S1611	0.000	0.000	0.503	0.000	0.000
M3012	0.000	0.000	0.000	0.000	0.443
E0313	0.518	0.000	0.000	0.000	0.000
L1014	0.000	1.010	0.000	0.000	0.000
S1715	0.000	0.000	0.324	0.000	0.000
P2416	0.000	0.000	0.000	0.903	0.000
M3117	0.000	0.000	0.000	0.000	0.755
A3818	0.000	0.000	0.000	0.000	1.076
E0419	1.129	0.000	0.000	0.000	0.000
S1820	0.000	0.000	1.624	0.000	0.000
M3221	0.000	0.000	0.000	0.000	0.447
L1122	0.000	0.895	0.000	0.000	0.000
P2523	0.000	0.000	0.000	1.232	0.000
A3924	0.000	0.000	0.000	0.000	0.976
E0525	0.128	0.000	0.000	0.000	0.000
L1226	0.000	0.978	0.000	0.000	0.000
S1927	0.000	0.000	1.348	0.000	0.000
P2628	0.000	0.000	0.000	0.840	0.000
M3329	0.000	0.000	0.000	0.000	0.609
A4030	0.000	0.000	0.000	0.000	1.036
E0631	0.853	0.000	0.000	0.000	0.000
S2032	0.000	0.000	0.614	0.000	0.000
M3433	0.000	0.000	0.000	0.000	0.080
L1334	0.000	0.805	0.000	0.000	0.000
P2735	0.000	0.000	0.000	1.026	0.000
A4136	0.000	0.000	0.000	0.000	0.509
E0737	0.593	0.000	0.000	0.000	0.000
L1438	0.000	0.560	0.000	0.000	0.000
S2139	0.000	0.000	1.528	0.000	0.000
P2840	0.000	0.000	0.000	1.243	0.000
M3541	0.000	0.000	0.000	0.000	0.327
A4242	0.000	0.000	0.000	0.000	1.360

PHI

	EROS	LUDUS	STORGE	PRAGMA	MANIAGAP
EROS	1.000				
LUDUS	-0.582	1.000			
STORGE	0.301	-0.250	1.000		
PRAGMA	0.115	0.080	0.115	1.000	
MANIAGAP	0.598	-0.351	0.144	0.190	1.000

CHI-SQUARE WITH 809 DEGREES OF FREEDOM = 2573.73 (P = .000)
GOODNESS OF FIT INDEX =0.772
ADJUSTED GOODNESS OF FIT INDEX =0.745
ROOT MEAN SQUARE RESIDUAL = 0.269

Appendix A.4
Factor Structure for Model 4
(n=499, v=42)

LAMBDA X

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
E0101	0.247	0.000	0.000	0.000	0.000	0.000
L0802	0.000	1.043	0.000	0.000	0.000	0.000
S1503	0.000	0.000	0.329	0.000	0.000	0.000
P2204	0.000	0.000	0.000	0.934	0.000	0.000
M2905	0.000	-0.486	0.000	0.000	0.977	-0.415
A3606	0.119	-0.161	0.000	0.000	-0.037	0.159
L0907	0.000	0.984	0.000	0.000	0.000	0.000
P2308	0.000	0.000	0.000	0.657	0.000	0.000
A3709	0.000	0.000	0.000	0.000	0.000	0.916
E0210	0.720	0.000	0.000	0.000	0.000	0.000
S1611	0.000	0.000	0.511	0.000	0.000	0.000
M3012	0.000	0.000	0.000	0.000	0.442	0.000
E0313	0.551	0.000	0.000	0.000	0.000	0.000
L1014	0.000	1.128	0.000	0.000	0.000	0.000
S1715	0.454	-0.259	0.138	0.000	0.000	0.002
P2416	0.000	0.000	0.000	0.898	0.000	0.000
M3117	0.000	0.000	0.000	0.000	0.845	0.000
A3818	0.000	0.000	0.000	0.000	0.372	0.869
E0419	1.120	0.000	0.000	0.000	0.000	0.000
S1820	0.000	0.000	1.619	0.000	0.000	0.000
M3221	0.000	0.000	0.000	0.000	1.007	0.000
L1122	-0.631	0.430	0.000	0.000	0.000	0.000
P2523	0.000	0.000	0.000	1.229	0.000	0.000
A3924	0.000	-0.047	0.000	0.000	0.160	0.888
E0525	0.211	0.000	0.000	0.000	0.000	0.000
L1226	0.000	1.146	0.000	0.000	0.000	0.000
S1927	-0.316	0.000	1.460	0.000	0.000	0.000
P2628	0.000	0.000	0.000	0.845	0.000	0.000
M3329	0.000	0.000	0.000	0.000	1.046	0.000
A4030	0.000	0.000	0.000	0.000	0.000	1.055
E0631	0.763	0.000	0.228	0.000	0.000	0.000
S2032	0.000	0.000	0.631	0.000	0.000	0.000
M3433	0.000	0.000	0.000	0.000	0.820	0.000
L1334	0.000	0.758	0.000	0.000	0.000	0.000
P2735	0.000	0.000	0.000	1.030	0.000	0.000
A4136	0.422	0.000	0.000	0.000	-0.323	0.422
E0737	0.611	0.000	0.000	0.000	0.000	0.000
L1438	0.000	0.594	0.000	0.000	0.000	0.000
S2139	0.000	0.000	1.509	0.000	0.000	0.000
P2840	0.000	0.000	0.000	1.248	0.000	0.000
M3541	0.000	0.000	0.000	0.000	0.804	0.000
A4242	0.000	0.000	0.000	0.000	0.000	1.403

PHI

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
EROS	1.000					
LUDUS	-0.446	1.000				
STORGE	0.266	-0.239	1.000			
PRAGMA	0.076	0.071	0.125	1.000		
MANIA	0.088	0.266	-0.054	0.344	1.000	
AGAPE	0.626	-0.309	0.175	0.132	0.441	1.000

CHI-SQUARE WITH 788 DEGREES OF FREEDOM = 2023.24 (P = .000)
GOODNESS OF FIT INDEX =0.832
ADJUSTED GOODNESS OF FIT INDEX =0.807
ROOT MEAN SQUARE RESIDUAL = 0.228

Appendix A.5
Factor Structure for Ancillary Model
With 20 Estimated LX Parameters, 15 Estimated Factor Correlations,
and 20 Estimated Theta Delta Values
(n=499, v=20)

LAMBDA X

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
L08C2	0.000	0.739	0.000	0.000	0.000	0.000
L0907	0.000	0.429	0.000	0.000	0.000	0.000
A3709	0.000	0.000	0.000	0.000	0.000	0.611
E0210	0.542	0.000	0.000	0.000	0.000	0.000
M3117	0.000	0.000	0.000	0.000	0.587	0.000
A3818	0.000	0.000	0.000	0.000	0.000	0.676
E0419	0.834	0.000	0.000	0.000	0.000	0.000
S1820	0.000	0.000	-0.738	0.000	0.000	0.000
M3221	0.000	0.000	0.000	0.000	0.448	0.000
P2523	0.000	0.000	0.000	0.694	0.000	0.000
A3924	0.000	0.000	0.000	0.000	0.000	0.649
P2628	0.000	0.000	0.000	0.433	0.000	0.000
M3329	0.000	0.000	0.000	0.000	0.719	0.000
S2032	0.000	0.000	-0.411	0.000	0.000	0.000
M3433	0.000	0.000	0.000	0.000	0.316	0.000
P2735	0.000	0.000	0.000	0.567	0.000	0.000
E0737	0.372	0.000	0.000	0.000	0.000	0.000
L1438	0.000	0.341	0.000	0.000	0.000	0.000
S2139	0.000	0.000	-0.951	0.000	0.000	0.000
A4242	0.000	0.000	0.000	0.000	0.000	0.741

PHI

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
EROS	1.000					
LUDUS	-0.538	1.000				
STORGE	-0.269	0.214	1.000			
PRAGMA	0.061	0.106	-0.054	1.000		
MANIA	0.133	0.198	-0.017	0.380	1.000	
AGAPE	0.530	-0.290	-0.155	0.130	0.508	1.000

CHI-SQUARE WITH 155 DEGREES OF FREEDOM = 476.26 (P = .000)
GOODNESS OF FIT INDEX =0.909
ADJUSTED GOODNESS OF FIT INDEX =0.877
ROOT MEAN SQUARE RESIDUAL = 0.075

Appendix A.6
Factor Structure for Ancillary Model
With 20 Estimated Theta Delta Values,
Fitting 20 LX Parameters and 15 Factor Correlations
from the (Thompson & Borrello, 1990) Study
($\underline{n}$=499, $\underline{v}$=20)

LAMBDA X

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
L0802	0.000	0.793	0.000	0.000	0.000	0.000
L0907	0.000	0.445	0.000	0.000	0.000	0.000
A3709	0.000	0.000	0.000	0.000	0.000	0.684
E0210	0.607	0.000	0.000	0.000	0.000	0.000
M3117	0.000	0.000	0.000	0.000	0.575	0.000
A3818	0.000	0.000	0.000	0.000	0.000	0.636
E0419	0.813	0.000	0.000	0.000	0.000	0.000
S1820	0.000	0.000	0.965	0.000	0.000	0.000
M3221	0.000	0.000	0.000	0.000	0.742	0.000
P2523	0.000	0.000	0.000	0.546	0.000	0.000
A3924	0.000	0.000	0.000	0.000	0.000	0.702
P2628	0.000	0.000	0.000	0.378	0.000	0.000
M3329	0.000	0.000	0.000	0.000	0.674	0.000
S2032	0.000	0.000	0.257	0.000	0.000	0.000
M3433	0.000	0.000	0.000	0.000	0.192	0.000
P2735	0.000	0.000	0.000	0.511	0.000	0.000
E0737	0.522	0.000	0.000	0.000	0.000	0.000
L1438	0.000	0.518	0.000	0.000	0.000	0.000
S2139	0.000	0.000	0.605	0.000	0.000	0.000
A4242	0.000	0.000	0.000	0.000	0.000	0.775

PHI

	EROS	LUDUS	STORGE	PRAGMA	MANIA	AGAPE
EROS	1.000					
LUDUS	-0.263	1.000				
STORGE	0.104	0.038	1.000			
PRAGMA	0.105	0.394	0.215	1.000		
MANIA	0.066	0.342	0.036	0.425	1.000	
AGAPE	0.328	-0.188	0.018	0.148	0.534	1.000

CHI-SQUARE WITH 190 DEGREES OF FREEDOM = 681.76 (P = .000)
GOODNESS OF FIT INDEX =0.870
ADJUSTED GOODNESS OF FIT INDEX =0.857
ROOT MEAN SQUARE RESIDUAL = 0.102

Appendix B
Inter-Item Variance-Covariance Matrix
(n=499, v=42)

	E0101	L0802	S1503	P2204	M2905	A3606	L0907	P2308	A3709	E0210
E0101	3.120									
L0802	-0.048	3.270								
S1503	-0.219	0.587	3.440							
P2204	0.190	0.457	0.052	3.893						
M2905	0.237	-0.222	0.077	0.321	3.447					
A3606	0.147	-0.264	0.011	0.006	0.190	0.915				
L0907	-0.027	1.052	0.106	0.137	-0.117	-0.299	3.097			
P2308	-0.034	0.454	0.073	0.904	0.214	0.045	0.141	2.923		
A3709	-0.101	-0.527	0.101	0.116	0.411	0.319	-0.519	0.111	2.392	
E0210	0.134	-0.448	-0.360	-0.034	0.138	0.202	-0.155	-0.043	0.340	1.618
S1611	-0.034	-0.260	0.237	0.177	-0.056	0.207	-0.217	0.185	0.120	0.359
M3012	0.249	-0.181	0.125	-0.027	0.271	-0.085	0.013	-0.180	0.421	0.258
E0313	0.292	-0.282	-0.227	0.168	0.052	0.135	-0.011	0.080	0.350	0.639
L1014	0.152	0.944	0.092	0.256	0.141	-0.143	1.347	-0.071	-0.092	-0.191
S1715	0.075	-0.633	-0.211	-0.075	-0.174	0.248	-0.364	-0.016	0.326	0.388
P2416	0.165	0.022	-0.134	0.831	0.333	0.172	-0.260	0.591	0.190	0.202
M3117	0.303	0.031	0.142	0.450	0.635	0.235	-0.443	0.198	0.607	0.276
A3818	0.109	-0.270	0.070	0.238	0.118	0.205	-0.290	0.118	1.114	0.142
E0419	0.149	-0.807	-0.400	0.010	0.069	0.291	-0.602	0.026	0.535	0.818
S1820	-0.708	-0.354	0.525	0.186	-0.170	0.186	-0.215	0.383	0.331	0.198
M3221	0.141	0.380	0.135	0.485	0.934	-0.060	0.229	0.222	0.261	-0.135
L1122	-0.340	0.986	0.288	0.296	-0.305	-0.303	0.835	0.234	-0.523	-0.629
P2523	0.140	0.317	-0.100	0.996	0.204	-0.013	-0.147	0.647	-0.227	-0.210
A3924	0.004	-0.199	-0.017	0.126	0.192	0.245	-0.351	0.235	0.982	0.145
E0525	0.819	-0.131	-0.204	0.013	0.403	-0.028	0.176	-0.239	0.186	0.080
L1226	0.012	0.798	0.170	-0.143	0.148	-0.253	1.375	-0.059	-0.135	-0.131
S1927	-0.875	0.119	0.816	0.232	-0.196	0.095	-0.177	0.315	0.146	0.113
P2628	0.329	-0.300	0.164	0.808	0.367	0.177	-0.508	0.663	0.442	0.151
M3329	0.096	0.408	0.355	0.299	0.601	-0.025	-0.056	0.227	0.550	0.131
A4030	0.324	-0.507	-0.297	0.091	0.278	0.256	-0.197	-0.086	0.868	0.498
E0631	0.198	-0.577	-0.186	0.087	-0.081	0.294	-0.465	0.153	0.438	0.544
S2032	-0.128	-0.564	0.029	0.100	-0.187	0.371	-0.523	0.214	0.405	0.312
M3433	0.096	0.992	0.595	0.339	0.512	-0.240	0.352	0.145	-0.088	-0.334
L1334	-0.243	1.044	0.722	0.283	-0.381	-0.258	0.515	0.199	-0.341	-0.613
P2735	0.109	0.405	-0.004	0.942	0.459	-0.017	0.124	0.808	0.012	-0.144

Appendix B (cont.)

	E0101	L0802	S1503	P2204	M2905	A3606	L0907	P2308	A3709	E0210
A4136	0.021	-0.517	-0.277	0.111	-0.153	0.246	-0.429	-0.105	0.570	0.543
E0737	0.458	-0.353	-0.565	0.155	-0.036	0.137	-0.196	0.111	0.235	0.603
L1438	-0.182	0.592	0.206	0.158	-0.160	-0.290	0.292	0.014	-0.131	-0.215
S2139	-0.586	-0.456	0.497	0.043	-0.249	0.242	-0.220	0.092	0.335	0.329
P2840	-0.051	0.252	-0.052	1.171	0.419	-0.068	-0.200	0.648	0.063	-0.208
M3541	0.158	0.580	0.224	0.226	0.347	-0.053	0.350	0.110	0.186	-0.258
A4242	0.211	-0.508	-0.236	0.214	0.188	0.378	-0.416	0.180	1.212	0.425

	S1611	M3012	E0313	L1014	S1715	P2416	M3117	A3818	E0419	S1820
S1611	1.796									
M3012	0.124	2.558								
E0313	0.356	0.292	2.224							
L1014	-0.247	0.239	0.028	3.390						
S1715	0.275	-0.059	0.344	-0.401	1.795					
P2416	0.412	-0.248	0.137	-0.149	0.084	3.410				
M3117	0.384	0.326	0.235	-0.156	0.164	0.241	3.233			
A3818	0.171	0.611	0.137	0.044	0.218	0.106	1.153	2.859		
E0419	0.317	0.260	0.544	-0.380	0.713	0.481	0.483	0.581	1.981	
S1820	0.762	-0.144	0.118	-0.591	0.356	0.359	0.182	0.100	0.416	4.205
M3221	0.190	0.476	0.095	0.460	-0.059	0.395	0.618	0.538	-0.095	0.068
L1122	-0.364	-0.331	-0.602	0.631	-0.571	-0.301	-0.419	-0.442	-0.976	-0.311
P2523	0.256	-0.209	-0.267	0.181	-0.056	1.192	0.204	0.134	0.139	0.099
A3924	0.099	0.354	0.329	-0.205	0.284	0.233	0.505	1.237	0.489	0.051
E0525	-0.156	0.213	0.079	0.275	0.169	0.301	0.007	0.063	0.219	-1.205
L1226	-0.233	0.058	0.237	1.993	-0.468	-0.219	-0.251	-0.156	-0.402	-0.664
S1927	0.609	-0.300	0.032	-0.490	0.240	0.330	0.107	-0.107	0.157	2.358
P2628	0.222	-0.129	0.125	-0.450	0.258	0.933	0.601	0.450	0.433	0.364
M3329	0.053	0.462	-0.019	0.085	-0.166	0.333	1.414	0.877	0.097	-0.039
A4030	0.151	0.488	0.493	-0.138	0.487	0.336	0.451	0.988	0.769	-0.098
E0631	0.460	0.059	0.313	-0.260	0.532	0.435	0.420	0.420	0.983	0.514
S2032	0.481	0.016	0.171	-0.452	0.567	0.455	0.205	0.407	0.694	0.810
M3433	-0.052	0.240	0.203	0.801	-0.272	-0.019	0.436	0.227	-0.174	-0.188
L1334	-0.192	-0.129	-0.520	0.523	-0.452	0.003	-0.433	-0.361	-0.694	0.224
P2735	-0.094	-0.015	-0.074	0.375	-0.294	0.603	0.403	0.257	-0.215	-0.168

Appendix B (cont.)

	S1611	M3012	E0313	L1014	S1715	P2416	M3117	A3818	E0419	S1820
A4136	0.393	0.196	0.358	-0.356	0.510	0.246	0.229	0.276	0.688	0.277
E0737	0.198	0.017	0.474	0.007	0.244	0.256	0.430	0.461	0.561	-0.024
L1438	-0.174	0.236	-0.202	0.706	-0.515	-0.109	-0.129	0.029	-0.384	-0.079
S2139	0.746	-0.055	0.065	-0.591	0.513	0.356	0.317	0.179	0.506	2.494
P2840	0.114	-0.143	-0.043	-0.015	-0.201	1.181	0.459	0.278	0.029	0.025
M3541	0.075	0.360	0.069	0.744	-0.142	-0.032	0.252	0.339	-0.095	0.116
A4242	0.282	0.572	0.436	-0.159	0.612	0.280	0.869	1.402	1.143	0.297

	M3221	L1122	P2523	A3924	E0525	L1226	S1927	P2628	M3329	A4030
M3221	3.126									
L1122	0.002	2.324								
P2523	0.490	0.252	3.656							
A3924	0.544	-0.361	0.297	2.445						
E0525	0.487	-0.165	0.183	0.181	3.196					
L1226	0.482	0.436	-0.132	-0.275	0.340	4.390				
S1927	-0.088	-0.184	0.173	0.006	-1.402	-0.364	3.545			
P2628	0.279	-0.526	1.073	0.288	0.044	-0.477	0.450	3.148		
M3329	0.895	-0.147	0.493	0.523	0.366	0.336	-0.161	0.550	2.885	
A4030	0.354	-0.727	0.216	1.008	0.424	-0.077	-0.123	0.645	0.618	2.986
E0631	-0.149	-0.564	0.215	0.339	0.008	-0.216	0.376	0.409	0.074	0.884
S2032	-0.028	-0.480	0.005	0.381	-0.122	-0.468	0.704	0.571	-0.132	0.535
M3433	1.015	0.099	0.323	0.178	0.047	1.065	-0.124	-0.095	0.760	-0.010
L1334	0.004	0.726	0.236	-0.683	-0.292	0.648	0.208	-0.277	0.051	-1.115
P2735	0.494	0.543	1.412	0.109	0.152	0.523	-0.135	0.632	0.538	-0.008
A4136	-0.120	-0.512	-0.125	0.409	0.077	-0.430	0.256	0.256	-0.027	0.613
E0737	0.198	-0.510	0.336	0.403	0.153	0.017	0.023	0.358	0.197	0.650
L1438	0.228	0.556	0.095	-0.275	-0.044	0.537	0.070	-0.174	0.159	-0.296
S2139	-0.053	-0.386	0.098	0.137	-0.880	-0.647	2.042	0.381	-0.037	0.060
P2840	0.312	0.158	1.544	0.287	-0.031	0.049	0.328	0.997	0.470	0.082
M3541	1.197	-0.018	0.185	0.280	0.241	0.764	-0.028	0.003	0.726	0.417
A4242	0.563	-0.700	0.112	1.365	0.479	-0.260	-0.164	0.548	0.566	1.492

Appendix B (cont.)

	E0631	S2032	M3433	L1334	P2735	A4136	E0737	L1438	S2139	P2840
E0631	1.603									
S2032	0.779	2.042								
M3433	-0.445	-0.171	4.323							
L1334	-0.514	-0.300	0.750	3.488						
P2735	-0.017	-0.113	0.788	0.528	3.338					
A4136	0.557	0.512	-0.415	-0.685	-0.159	1.782				
E0737	0.470	0.386	0.024	-0.558	0.262	0.564	2.213			
L1438	-0.249	-0.280	0.212	0.588	0.317	-0.217	-0.095	1.850		
S2139	0.615	0.955	-0.295	0.118	-0.086	0.441	0.144	-0.180	2.981	
P2840	0.174	0.187	0.545	0.098	1.399	-0.154	0.056	0.094	0.257	3.659
M3541	-0.071	-0.211	1.026	0.350	0.040	-0.206	-0.042	0.386	-0.054	-0.020
A4242	0.889	0.715	-0.054	-0.836	0.014	0.799	0.647	-0.274	0.406	0.126

	M3541	A4242
M3541	3.536	
A4242	0.548	3.149